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Amphibians and Reptiles

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Introduction

Approximately 460 species of amphibians and reptiles are known to occur in the continental United States. Amphibians and reptiles are vertebrates, along with fish, birds, and mammals. Worldwide, there are approximately 4,600 known amphibian species (fig. 1) similar to the number of known mammal species (approximately 4,000). There are about 6,000 known reptile species worldwide. The term *herps* refers to amphibians and reptiles as a group. Most herps lay eggs, although, some give birth to live young. The body temperatures of nearly all amphibians and reptiles are primarily determined by external sources of heat, such as the sun, water, or ground. This limits their distribution and activity time, but allows them to live on about one-tenth of the energy that similar-sized mammals and birds require. Herps control their body temperatures by moving to cooler or warmer areas as necessary.

Reptiles have dry skin and scales, shields, or plates to help keep their skin from losing moisture. Most reptiles with feet have claws on their toes. Reptiles lay shelled eggs or bear live young. Young reptiles have the same body forms as their parents, though they may differ in color or pattern. Reptiles living in North America include turtles and tortoises, crocodiles and alligators, lizards, and snakes.

Many amphibians have moist skin that lacks scales, feathers, or hair. Most adult amphibians have lungs, but respiration also occurs through the skin—a process that can only occur if the skin is moist. Unlike reptiles, amphibians' toes are usually clawless, and their eggs lack shells and are laid in water or a moist environment to protect them from drying out. In general, amphibian eggs hatch into aquatic larvae (or tadpoles) that eventually metamorphose into the adult form that is more terrestrial. Common amphibians of North America include salamanders, frogs, and toads.

This leaflet was created to provide landowners with information about amphibians and reptiles. By reading this leaflet, landowners will recognize the ecological value of herps, learn about threats to these animals, and gain insight on what they can do to help. The leaflet presents the habitat requirements of amphibians and reptiles and offers suggestions for increasing habitat quality and availability.

Figure 1 Tiger salamander (*Ambystoma tigrinum*)

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Ecological significance

Amphibians and reptiles play a major role in ecological food webs, as both predators and prey. As consumers of insects, rodents, and other pest species, herps also provide a significant benefit to agriculture and recreational activities. When abundant, amphibians can consume substantial quantities of favored prey organisms, perhaps serving to limit prey populations. For example, salamanders appear to play important roles in organizing many terrestrial and aquatic communities. The larvae of mole salamanders are top predators in vernal pond communities and influence the abundance and diversity of aquatic invertebrates and other amphibians therein. By serving as prey, herps provide food for small mammals, birds, and other herps.

Amphibians and reptiles are particularly sensitive to habitat disturbance. Because of their close contact with air, water, and soil, amphibians are consid-

ered to be good indicators of environmental health. Amphibians have highly permeable skin that rapidly absorbs toxic substances in the air, water, and soil. Amphibians have complex life cycles and need appropriate habitat for egg, larval, and adult stages. For many amphibian and reptile species, seasonal movements within the landscape are necessary, meaning that a variety of quality seasonal and transitional habitats must be available for any given species. Furthermore, many amphibians and reptiles have poor dispersal abilities and are often unable to move to alternate areas when their habitat is disturbed.

Habitat requirements

Amphibians and reptiles can be found in almost all habitat types, from forests to deserts to grasslands. Many species use different habitats during different times of the year. For example, many salamanders spend most of the year dispersed in the forest, but they need appropriate wetlands within which to breed. Some turtles live in water but must travel onto land to lay their eggs. Many herps hibernate or become less active during the winter. Hibernation occurs in hibernacula, which are usually dark, secure, secluded areas such as rocky outcroppings, crayfish burrows, mammal burrows, or mud at the bottom of ponds or wetlands.

Because of their unique life cycles, amphibians often require both aquatic and terrestrial habitats. Depending on the species and geographical area, they may require damp areas (creeks, streams, swamps, mud puddles, ponds, etc.), moist soil, and/or places to burrow in order to keep their skin moist. Amphibians generally breed and lay eggs in wetlands and other aquatic habitats, some of which exist for only short periods during the year (after rains or snowmelt), and then move to terrestrial areas to over winter. Amphibians use a wide range of terrestrial habitats adjacent to wetlands and streams, typically consisting of leaf litter, coarse woody material, boulders, small mammal burrows, crack in rocks, spring seeps, rocky pools, and even deserts and desert grasslands.

Some reptiles have very general habitat requirements, while others have specific ones. Reptiles can live in terrestrial, aquatic, or riparian habitats. Those that inhabit riparian habitats are not considered aquatic, but they are strongly associated with riparian-upland transitional zones. Some reptiles live and forage in aquatic habitats most of the year but move to upland habitats to nest or overwinter. Within grasslands, woodlands, and wetlands, reptiles require habitats that provide thermal gradients ranging from cool shelters to warm basking areas that receive exposure to full sun. Reptiles also require suitable hibernation and aestivation habitats to which they can escape during times of environmental extremes. Thermal, hibernation, and aestivation habitats may be present in the form of large woody material, brush piles, rock piles or outcroppings, animal burrows, or huts. These same habitats provide nesting habitat for many snakes and lizards, while nesting habitat for turtles may be found within areas of loose or sandy soil exposed to full sun and protected from flooding.

Amphibians and reptiles are a diverse group and their habitat requirements vary greatly from species to species. Specific habitat requirements for individual species are beyond the scope of this leaflet. Table 1 contains general shelter, feeding, and nesting cover requirements for the major groups of amphibians and reptiles.

Threats to populations

Some amphibian and reptile populations are on the decline. For example, populations of western toads have declined or disappeared from the Rocky Mountains, the Sierra Nevada Mountains, and the Cascade Mountains. Populations of red-legged frogs (fig. 2) have disappeared from parts of California and Oregon. Populations of Blanchard's cricket frogs have declined or disappeared from the Midwest. In addition to the declines, frogs with multiple, missing, or malformed legs have been sighted in high numbers in Canada and the United States. These declines and deformities are happening around the world. Some of the documented causes of amphibian and reptile population declines and deformities are habitat loss and

Figure 2 Red-legged frogs (*Rana aurora*)

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Table 1 General habitat requirements of North American reptiles and amphibians

Group	Foraging Habitat	Food	Breeding Habitat
Reptiles			
Crocodiles and alligators	In and around water (lakes, ponds, swamps, rivers)	Insects, snails, crustaceans, reptiles, frogs, fish, birds, mammals	In ground or in heaped vegetation and soil
Lizards	In cracks and crevices, in rock or brush piles, in tree trunks or foliage, under rocks and logs, among leaf litter or vegetation, underground	Leaves, fruit, flowers, insects, snails, scorpions, crabs, other invertebrates, eggs, small mice, lizards	In soil, under fallen leaves, in crevices, in rotting logs
Snakes	On the ground, in crevices or burrows, in rock or brush piles, in trees, in water	Insects, spiders, snails, slugs, crayfish, crabs, fish, salamanders, frogs, lizards, turtles, birds, eggs, small mammals	Upland, riparian, or wetland areas, burrows, rotting logs
Turtles and tortoises	In salt or fresh water, on land (forests, deserts, grasslands)	Aquatic plants, grasses, berries, fruit, flowers, leaves, insects, worms, slugs, snails, crustaceans, other invertebrates, frogs, snakes, turtles, fish, jellyfish	Well-drained sandy or loose soil; sometimes associated with burrows
Amphibians			
Frogs and toads	Under logs, in leaf litter, in damp rock crevices, in soft soil or mud, in shrubs and trees, in water, beneath the soil surface	Tadpoles – algae, plant detritus, leaves, other tadpoles Adults – Insects, worms, other invertebrates, frogs, snakes, lizards, small turtles, small birds, mammals	Fresh water or moist areas
	Cool, damp, shady places; in caves or burrows, in trees, under rocks and logs, on ground, in water; underground	Larvae – insects and other invertebrates, small crustaceans, tadpoles, zooplankton, other salamander larvae Adults – insects, worms, and other invertebrates, fish, other salamanders, small mice	Fresh water or moist areas

fragmentation, the alteration of natural disturbance regimes, predation by and competition with non-native and invasive species, disease, environmental pollution, severe weather, and UV radiation.

Habitat loss and fragmentation is a major factor in the decline of amphibian and reptile species (fig. 3). Many habitats are disappearing due to human population growth and development. Of those habitats that do remain, many are not large enough to support populations of a given species. If required habitat components are isolated from each other by agricultural fields, roadways, or urban development, the animals may not be able to reach them. Roads pose barriers that are of particular concern to amphibian and reptile movements. Often herps are not physically able to cross roadways, and those that are run the risk of being killed by vehicles.

The alteration of natural disturbance regimes, such as fire and flood regimes, can be detrimental to amphibian and reptile populations. In many ecosystems, these disturbances help to maintain various stages of vegetative succession, providing amphibians and reptiles with their diverse habitat needs. Humans have altered natural disturbance regimes, by suppressing fire, controlling flood levels, and other means. In the absence of fire, flooding, or other natural disturbances, natural habitats become degraded and are less capable of supporting amphibian and reptile populations.

The introduction of non-native species is another major cause of amphibian and reptile decline. Native species have not evolved with these new predators or competitors and are often unable to survive in areas where non-native species are introduced. For example, bullfrogs were introduced west of the Rocky Mountains in the 1800s for human consumption. These bullfrogs are efficient predators of local amphibians and some reptiles. Populations of yellow-legged frogs and other frogs are declining in areas where bullfrogs are now abundant. Fire ants, introduced to the southern United States around 1918, prey on both the eggs and young of reptiles. Fire ants are considered to be the primary cause of the extirpation of the Texas horned lizard from parts of its historic range. In the Southwest, non-native crayfish have been implicated in the decline of some amphibian and aquatic reptile species.

Some amphibian deformities and population declines can be attributed to diseases caused by viruses, bacterium, fungi, or parasites. A parasitic fungus has been identified as the cause of mass mortality in frogs in the Americas, Australia, and other areas; this fungus is now thought to be one of the primary suspects responsible for amphibian declines around the world. An upper respiratory tract disease is the potential cause of population declines in desert tortoises in the southwestern United States and gopher tortoises in the southeastern United States. Often, non-native species will act as vectors for these diseases. For example, the water fungus *Saprolegnia*, common in fish hatcheries, has recently been associated with declines of amphibian populations.

Figure 3 Collared lizard (*Crotaphytus collaris*)

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Amphibian and reptile populations are negatively affected by environmental pollutants, such as heavy metals, pesticides, and radioactive waste. These pollutants are suspected of causing deformities and abnormalities in frogs. Acid rain raises the acidity of water above the tolerance levels of many amphibian eggs and tadpoles. This reduces fertilization and can cause developmental abnormalities. Even though they have been banned in the United States since 1979, traces of polychlorinated biphenyls (PCBs), toxic, persistence pollutants, can be found in air, soil, water, and animal tissues. Some PCB compounds are similar to estrogen and can alter the sexual development of amphibian and reptile embryos. For example, sex reversal and abnormal gonads have been found in turtles exposed to PCBs.

Changes in climate, including higher temperatures, lower soil moisture, longer dry seasons, and more variability in rainfall, can influence amphibian and reptile populations. These climate changes can mean fewer insects available as prey for some species, changes in activity patterns, depressed immune systems due to stress, and shorter breeding seasons because ponds hold less water for shorter periods. Warmer temperatures impact crocodiles, alligators, and some turtles (fig. 4) whose sex ratios are determined by nest temperatures during incubation.

Figure 4 Eastern box turtle (*Terrapene carolina carolina*)

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High UV radiation resulting from a thinner ozone layer can cause a variety of problems in amphibians — DNA mutations, suppressed immune systems, and developmental problems or death in embryos.

Habitat management considerations

Managing habitat for amphibians and reptiles can take many forms, depending on the landowner's geographical location, land use activities, habitat type, and the target species. Before beginning, landowners should compile a list of amphibians and reptiles that occur on their properties and their locations to determine the priority areas for habitat management. Landowners are encouraged to consult with local natural resource professionals and/or herpetologists to design the best possible habitat management plan for amphibians and reptiles in their region. Some actions that can be taken are:

- Provide logs, rocks, and brush piles around wetland areas and in upland areas;
- Keep a vegetated buffer (minimum 50 feet) around wetlands and streams;
- Provide upland habitat adjacent to wetland areas (500 feet or wider if possible);
- Ensure that vegetation is not too dense for herp movement by promoting a variety of native sedges, forbs, and warm- and cool-season grasses;
- Avoid introducing non-native plants or animals, and control any that have already been introduced;
- Avoid introducing fish to breeding areas;
- Avoid altering natural water levels in wetlands, rivers, and streams, particularly from the time herps migrate to overwintering sites through to spring emergence;
- Maintain shallow water areas or pools for breeding amphibians;
- Plan any prescribed burning activity to avoid times when amphibians and reptiles are particularly active (breeding migrations, dispersal from hibernacula);
- Avoid using pesticides within 100 yards of streams or wetlands;
- Limit pesticide use to brands that rapidly decompose after application;
- Rotate livestock to prevent excessive grazing;
- Keep livestock out of wetlands and riparian areas;
- Avoid off-road vehicle use;
- Avoid building roads in sensitive areas;
- Build road crossings to help amphibians and reptiles cross roads safely; and
- Avoid fragmenting habitats.

For more information

Partners in Amphibian and Reptile Conservation (PARC) is an inclusive partnership dedicated to the conservation of amphibians and reptiles and their habitats. PARC's Web site, *www.parcplace.org*, is an excellent resource for information on amphibians and reptiles, their habitat requirements, and habitat management considerations. In particular, PARC is developing Amphibian and Reptile Habitat Management Guidebooks for five geographical regions across the United States that can be useful to landowners. These guidebooks can be downloaded from PARC's Web site.

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